AlazarTech

ATS330
50 MS/s 12-Bit PCI Digitizer

- 2 channels sampled at 12-bit resolution
- 50 MS/s simultaneous real-time sampling rate on each input
- ±40 mV to ±20 V input range
- Up to 8 million samples of on-board acquisition memory per channel
- AlazarDSO® oscilloscope software
- Software Development Kit supports C/C++, C#, Python, MATLAB®, LabVIEW®
- Support for Windows® & Linux®

Not recommended for new designs

RoHS3 COMPLIANT
2015/863/EU

CE

For new designs, please use ATS9130

Product	Bus	Operating System	Channels	Max. Sample Rate	Bandwidth	Memory Per Channel	Resolution
ATS330	PCI 32 bit 33 MHz	64-bit Windows & 64-bit Linux	2	50 MS/s	25 MHz	128K Std. or 8M Optional	12 bits

Overview

AlazarTech ATS®330 is a dual-channel, 12 bit, 50 MS/s waveform digitizer card for PCI bus, capable of storing up to 8 Million samples per channel of acquired data in its on-board memory.

It should be noted that it is not possible for ATS330 acquisition memory to be dual-ported. For applications that require dual-port memory, consider using ATS9130.

For scientific customers who want to record multiple analog inputs simultaneously, ATS330 offers multi-channel data acquisition systems of up to 8 channels.

ATS330 is supplied with AlazarDSO oscilloscope software that lets the user get started immediately without having to write any software.

Users who need to integrate the ATS330 in their own program can purchase a software development kit, ATS-SDK, for C/C++, C#, Python, MATLAB, and LabVIEW for both Windows and Linux operating systems.

All of this advanced functionality is packaged in a low-power, half-length PCI card.

Not Recommended for New Designs

Motherboards with PCI slots are becoming increasingly difficult to source. Customers should, therefore, consider using the ATS9130 PCIe waveform digitizer, which provides 12-bit, 50 MS/s dual-channel sampling, and dual-port memory, for the same price as ATS330.

Dual-port memory, which allows streaming of very large gapless data across the PCIe bus for storage in fast disk drives, is not available on ATS330.

Applications

Ultrasonic & Eddy Current NDT/NDE

Motor Winding Testing

High-Resolution Oscilloscope

Multi-Channel Transient Recording
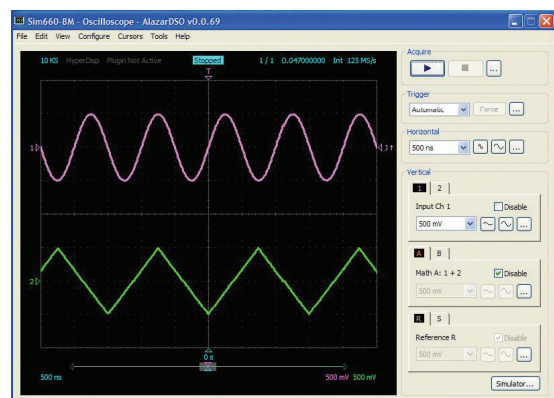
Analog Input

An ATS330 features two analog input channels with extensive functionality. Each channel has 25 MHz of full power analog input bandwidth. With software-selectable attenuation, you can achieve an input voltage range of ±40 mV to ±20 V. Attenuating probes (sold separately) can extend the voltage range even higher.

Software-selectable AC or DC coupling further increases the signal measurement capability. Software-selectable 50 Ω input impedance makes it easy to interface to high-speed RF signals.

Acquisition System

ATS330 PCI digitizers use a pair of 50 MS/s, 12-bit ADCs to digitize the input signals. The real-time sampling rate ranges from 50 MS/s down to 10 KS/s. The two channels are guaranteed to be simultaneous, as they share the exact same clock.

An acquisition can consist of multiple records, with each record being captured as a result of one trigger event. Minimum number of records is 1 and maximum is 1000. A record may contain both pre-trigger and post-trigger data.

In between the multiple records being captured, the acquisition system is re-armed by the hardware within 8 sampling clock cycles. This mode of capture, sometimes referred to as Multiple Record or Pre-Trigger Multiple Record, is very useful for capturing data in applications with a very rapid trigger rate.

Examples of such applications include ultrasonic testing, NMR spectroscopy, motor testing and lightning test.

On-Board Acquisition Memory

The standard ATS330 PCI digitizer features 128 Kilo samples of acquisition memory for each channel.

Acquisition memory can optionally be upgraded to provide 8 Million samples per channel of signal storage.

Data is acquired into the onboard memory before being transferred to the host PC memory. This transfer is performed using Direct Memory Access (DMA), which uses scatter-gather bus mastering technology.
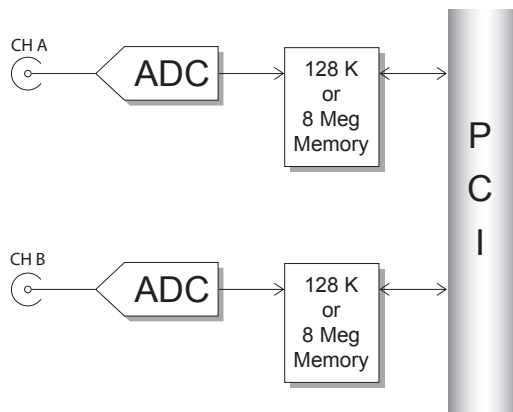
Output Data Format

By default, ATS330 data comes out as unsigned binary, where code 0 represents the negative full scale, code (2^n-1) represents the positive full scale with zero being 2^{n-1}.

It is possible to change the data format to signed binary using an API call. In signed binary format, zero is represented by code 0, positive full scale is represented by $(2^{n-1}-1)$ and negative full scale is represented by (2^{n-1}).

Triggering

The ATS330 is equipped with sophisticated digital triggering options, such as programmable trigger thresholds and slope on any of the input channels or the External Trigger input.

While most oscilloscopes offer only one trigger engine, ATS330 offers two trigger engines (called Engines J and K). This allows the user to combine the two engines using a logical OR, AND or XOR operand.

The user can specify the number of records to capture in an acquisition, the length of each record and the amount of pre-trigger data.

A programmable trigger delay can also be set by the user. This is very useful for capturing the signal of interest in a pulse-echo application, such as ultrasound, radar, lidar etc.

Trigger Time Stamp

A 40-bit time stamp counter comes standard with the ATS330. By default, this counter is initialized to a zero value when an acquisition session is started and increments once for every two samples captured, thus providing a 2-clock timing accuracy. At 50 MS/s sample rate, this counter will not roll over for well over 2 hours.

The value of this counter is latched into trigger memory for each trigger, i.e. once per record, for up to specified number of records.

This allows the user to find out the timing of each trigger in a multiple record acquisition relative to the start of the acquisition.

It is also possible to configure the timestamp counter to reset for the first acquisition only and never again, until a software reset is issued. This feature enables users to obtain precise timing information about multiple acquisitions.

Multiple-Digitizer Synchronization

ATS330 features a Leader/Follower connector that allows synchronization of multiple digitizers to allow truly synchronous sampling across as many as 8 channels.

A SyncBoard 330 (sold separately) is required to connect the Leader/Follower connectors on multiple digitizers in the system together. Such a system is called a Leader/Follower system.

SyncBoard 330 is available for 2 board synchronization or 4 board synchronization.
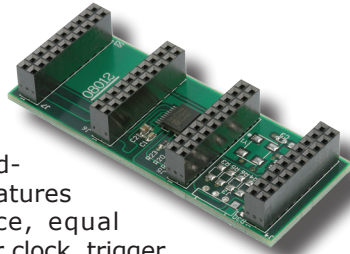
SyncBoard is a board-level product that features controlled impedance, equal length traces to deliver clock, trigger, and initialization signals to each ATS330 in the system.

A Leader/Follower system is guaranteed to sample simultaneously across all channels in that system. Triggering is also guaranteed to be simultaneous across all digitizers in the system.

Optional External Clock

While the ATS330 features a low-jitter, high-reliability 50 MHz crystal oscillator as the source of the timebase system, there may be occasions when digitizing has to be synchronized to an external clock source.

ATS330 External Clock option provides a BNC input for a TTL compatible external clock signal with a frequency between 50 MHz and 1 MHz.

This clock signal is terminated on the ATS330 printed circuit board using a 50 Ω resistor. As such, the external clock circuitry must have sufficient drive (± 66mA) to inject the clock signal properly.

The active edge of the external clock is software-selectable between the rising or falling edge.

Users can also set a decimation factor for the external clock. For example, if the user wants to digitize the input signal on every tenth clock edge, this factor can be set to 10. Minimum decimation value is 1 and maximum is 100,000.

Optional Trigger Output

ATS330 can be optionally equipped with a Trigger Output capability. This option uses the ECLK BNC connector to output a TTL signal synchronous to the ATS330 Trigger signal, allowing users to synchronize their test systems to the ATS330 Trigger.

When combined with the Trigger Delay feature of the ATS330, this option is ideal for ultrasonic and other pulse-echo imaging applications.

Customers who want both External Clock and Trigger Output options on their ATS330 digitizers should contact the factory for arriving at an appropriate cabling solution.

Calibration

Every ATS330 digitizer is factory calibrated for gain and offset accuracy to NIST- or CNRC-traceable standards. To recalibrate an ATS330, the digitizer must be shipped back to the factory.

AlazarDSO Software

ATS330 is supplied with the powerful AlazarDSO software that allows the user to setup the acquisition hardware and capture, display and archive the signals.

The Stream-To-Memory command in AlazarDSO allows users to stream a large dataset to motherboard memory.

AlazarDSO software also includes powerful tools for benchmarking the computer bus and disk drive.

Software Development Kits

AlazarTech® provides easy-to-use software development kits for customers who want to integrate the ATS330 into their own software.

A Windows-compatible software development kit, called ATS-SDK, includes headers, libraries and source code sample programs written in C/C++, C#, Python, MATLAB, and LabVIEW.

A Linux-compatible software development kit, called ATS-devel, includes headers, libraries and source code sample programs written in C++ and Python.

These programs can fully control the ATS330 and acquire data in user buffers.

The purchase of an ATS-SDK license includes a subscription that allows users to download ATS-SDK updates from the AlazarTech website for period of 12 months from the date of purchase.

Customers who want to download new releases beyond this 12 month period should purchase extended maintenance (order number ATS-SDK-1YR).

Support for Windows

Windows support for ATS330 includes Windows 11, Windows 10, Windows Server® 2019, and Windows Server 2016. As Windows Server 2019 and 2016 are seldom used by our customers, they are expected to work but are not regularly tested with each software release. If there are issues related to Windows Server 2016 or 2019, tech support may not be as rapid as for other operating systems.

Only 64-bit Windows operating systems are supported. The last 32-bit Windows driver is version 5.10.24, which supports Windows 7.

Microsoft mainstream support ended in 2018 for Windows 8.1 and Windows Server 2012 R2. As such, AlazarTech has ceased development on these operating systems. Current software and driver releases may work with these operating systems but they are not officially supported.

Due to lack of demand and due to the fact that Microsoft no longer supports these operating systems, AlazarTech no longer supports Windows 8, Windows 7, Windows XP, Windows Vista, Windows Server 2012, Windows Server 2008 R2, and Windows Server 2008.

Linux Support

AlazarTech offers Dynamic Kernel Module Support (DKMS) drivers for the following Linux distributions: Ubuntu, Debian, and RHEL®.

AlazarTech DKMS drivers may work for other Linux distributions but they have not been tested and technical support may be limited.

Users can download the DKMS driver and associated library for their specific distribution here: www.alazartech.com/en/linux-drivers/ats330/22/

Only 64-bit Linux operating systems are supported.

A GUI application called AlazarFrontPanel that allows simple data acquisition and display is also provided.

ATS-SDK includes source code example programs for Linux, which demonstrate how to acquire data programmatically using a C compiler. Note that example programs are only provided for Python and C++.

Based on a minimum annual business commitment, the Linux driver source code license (order number ATS330-LINUX) may be granted to qualified OEM customers for a fee. For release of driver source code, a Non-Disclosure Agreement must be executed between the customer's organization and AlazarTech.

All such source code disclosures are made on an as-is basis with limited support from the factory.

Technical Support

AlazarTech is known for its world-class technical support. Customers receive free technical support on hardware products that are under warranty.

AlazarTech digitizers come with a standard one (1) year parts and labor warranty. This warranty can be extended for a fee (more information can be found in the next section: Extended Warranty).

If your waveform digitizer is out of warranty, you will not be eligible for free technical support on AlazarTech hardware or software products and you will need to purchase technical support hours (order number SUPPORT-HR5) to obtain assistance.

In addition, any necessary repairs to your out-of-warranty hardware products will carry a minimum bench charge.

Accessories for Out-of-Warranty Products

Accessories, such as SyncBoards, purchased for use with in-warranty digitizer cards will be covered by a 1-year warranty.

Accessories purchased for use with out-of-warranty digitizers will not be warranted against defects in materials and workmanship. As AlazarTech cannot verify with certainty that the cause of any malfunction is not due to the non-warranted digitizer, accessories purchased for out-of-warranty digitizers will require a warranty waiver.

Upgrading Your Digitizer in The Field

It is always recommended to get upgrades installed at the factory with the initial digitizer purchase.

If the digitizer is still under warranty, it may be possible to add certain upgrades in the field, but there is a small chance that the upgrade will not work, in which case the digitizer would need to be returned to the factory to complete the upgrade.

If the digitizer is no longer under warranty, the upgrade must be done at the factory and there will be a minimum service charge in addition to the cost of the upgrade. This is so that AlazarTech can verify that the digitizer meets basic performance levels prior to any upgrade.

Extended Warranty

The purchase of an ATS330 includes a standard one (1) year parts and labor warranty. AlazarTech hardware parts and labor warranty should be maintained to ensure uninterrupted access to technical support and warranty repair services.

Customers may extend their warranty by ordering the appropriate Extended Warranty:

    ATS330-061 for ATS330-128K
    ATS330-062 for ATS330-8M

This should be purchased before expiration of the standard warranty (or before expiration of an Extended Warranty).

If the warranty lapses, renewal at a later date will be subject to a reinstatement fee, to cover the administrative costs of warranty reinstatement, and a 6-month waiting period for repair claims. Furthermore, warranty must be extended at least 6 months past the current date.

Users can purchase up to 4 (four) additional years of warranty extensions for a maximum total of 5 years of warranty.

Get your warranty end date by registering your product at: www.alazartech.com/en/my-account/my-products/.

Export Control Classification

According to the Export Controls Division of Government of Canada, ATS330 is currently not controlled for export from Canada. Its export control classification is N8, which is equivalent to ECCN EAR99. ATS330 can be shipped freely outside of Canada, with the exception of countries listed on the *Area Control List* and *Sanctions List*. Furthermore, if the end-use of ATS330, in part or in its entirety, is related to the development or deployment of weapons of mass destruction, AlazarTech is obliged to apply for an export permit.

RoHS Compliance

ATS330 units built after June 2007 are fully RoHS compliant, as defined by Directive 2015/863/EU (RoHS 3) of the European Parliament and of the Council of 31 March 2015 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

All manufacturing is done using RoHS-compliant components and lead-free soldering.

REACH Compliance

AlazarTech verifies its supply chain against the latest REACH requirements. A compliance statement is usually available within 6 months of release of the European Chemicals Agency (ECHA) updated substance of very high concern (SVHC), Authorizations, and Restrictions lists.

EC Conformity

ATS330 conforms to the following standards:

Electromagnetic Emissions:
CISPR 22:2006/EN 55022:2006 (Class A): Information Technology Equipment (ITE). Radio disturbance characteristics. Limits and method of measurement.

Electromagnetic Immunity:
CISPR 24:1997/EN 55024:1998 (+A1 +A2): Information Technology Equipment Immunity characteristics — Limits and methods of measurement.

Safety:
IEC 60950-1:2005: Information technology equipment — Safety — Part 1: General requirements.

IEC 60950-1:2006: Information technology equipment — Safety — Part 1: General requirements.

ATS330 also follows the provisions of the following directives: 2006/95/EC (Low Voltage Equipment); 2004/108/EC (Electromagnetic Compatibility).

FCC & ICES-003 Compliance

ATS330 has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15, subpart B of the FCC Rules, and the Canadian Interference-Causing Equipment Standard ICES-003:2004.

System Requirements

Personal computer with at least one free PCI slot, 512 MB RAM, 100 MB of free hard disk space

Power Requirements

+5 V	1.5 A, typical for ATS330-128K
	1.7 A, typical for ATS330-8M
	+5V voltage level must remain between the range of 4.75 V to 5.20 V at all times after power-on

Physical

Size	Single slot, half length PCI card (4.225 inches x 7.7 inches excluding the connectors protruding from the front panel)
Weight	500 g

I/O Connectors

CH A, CH B, EXT, ECLK	BNC female connectors

Environmental

Operating temperature	0 to 55 degrees Celsius, ambient
Storage temperature	-20 to 70 degrees Celsius
Relative humidity	5 to 95%, non-condensing

Acquisition System

Resolution	12 bits
	Data is returned as MSB-justified 16-bit unsigned integers
Bandwidth (-3 dB)	
DC-coupled, 1 MΩ	DC - 25 MHz
DC-coupled, 50 Ω	DC - 25 MHz
AC-coupled, 1 MΩ	10 Hz - 25 MHz
AC-coupled, 50 Ω	100 kHz - 25 MHz
Bandwidth flatness:	± 1 dB
Number of channels	2, simultaneously sampled
Maximum Sample Rate	50 MS/s single shot
Minimum Sample Rate	1 KS/s single shot for internal clocking
Full Scale Input ranges	
1 MΩ input impedance:	±40 mV, ±50 mV, ±80 mV, ±100 mV, ±200 mV, ±400 mV, ±500 mV, ±800 mV, ±1 V, ±2 V, ±4 V, ±5 V, ±8 V, ±10 V, and ±20 V, software-selectable
50 Ω input impedance:	±40 mV, ±50 mV, ±80 mV, ±100 mV, ±200 mV, ±400 mV, ±500 mV, ±800 mV, ±1 V, ±2 V, and ±4 V, software-selectable
DC accuracy	±2% of full scale in all input ranges
Input coupling	AC or DC, software-selectable
Input impedance	50 Ω or 1 MΩ ±1% in parallel with 50 pF ±10 pF, software-selectable
Absolute maximum input	
1 MΩ	±28 V (DC + peak AC for CH A, CH B and EXT only without external attenuation)
50 Ω	±4 V (DC + peak AC for CH A, CH B and EXT only without external attenuation)

On-Board Acquisition Memory System

Onboard acq memory	512 Kilobytes for ATS330-128K
	32 Megabytes for ATS330-8M
Acquisition Memory/ch	Up to 128,000 samples per channel for ATS330-128K
	Up to 8 Million samples per channel for ATS330-8M
Record Length	Software-selectable with 16-point resolution. Record length must be a minimum of 256 points. Maximum record length is limited by the acquisition memory per channel.
Number of Records	Software-selectable from a minimum of 1 to a maximum of 1000 or (Acquisition Memory Per Channel / (Record Length+4)), whichever is lower
Pre-trigger depth	0 to (Record Length-64), software-selectable with 16-point resolution
Post-trigger depth	Record Length - Pre-trigger depth

Timebase System

Timebase options	Internal Clock or External Clock (Optional)
Internal Sample Rates	50 MS/s, 25 MS/s, 10 MS/s, 5 MS/s, 2 MS/s, 1 MS/s, 500 KS/s, 200 KS/s, 100 KS/s, 50 KS/s, 20 KS/s, 10 KS/s, 5 KS/s, 2 KS/s, 1 KS/s
Internal Clock accuracy	±100 ppm

Dynamic Parameters

Typical values measured using a randomly selected ATS330 in ±1 V input range, DC coupling and 50 Ω impedance. Input was provided by a HP8656A signal generator, followed by a 9-pole, 1 MHz band-pass filter. Input frequency was set at 1 MHz and amplitude was 650 mV rms (92% of full scale input).

SNR	60 dB
SINAD	58 dB
THD	-61 dB
SFDR	-62 dB

Note that these dynamic parameters may vary from one unit to another, with input frequency and with the full scale input range selected.

Optional ECLK (External Clock) Input

Signal Level	TTL levels. Compatible with both 3.3 V and 5 V TTL
Input impedance	50 Ω
Input current requirement	±66 mA
Maximum frequency	50 MHz with 50% ±5% duty cycle
Minimum frequency	1 MHz with 50% ±5% duty cycle
Decimation factor	Software-selectable from 1 to 100,000
Sampling Edge	Rising or Falling, software-selectable

Triggering System

Mode	Edge triggering with hysteresis
Comparator Type	Digital comparators for internal (CH A, CH B) triggering and analog comparators for TRIG IN (External) triggering
Number of Trigger Engines	2
Trigger Engine Combination	Engine J, engine K, J OR K, software-selectable
Trigger Engine Source	CH A, CH B, EXT, Software or None, independently software-selectable for each of the two Trigger Engines
Hysteresis	±5% of full scale input, typical
Trigger sensitivity	±10% of full scale input range. This implies that the trigger system may not trigger reliably if the input has an amplitude less than ±10% of full scale input range selected
Trigger level accuracy	±10%, typical, of full scale input range of the selected trigger source
Bandwidth	25 MHz
Trigger Delay	Software-selectable from 0 to 9,999,999 sampling clock cycles
Trigger Timeout	Software-selectable with a 10 μs resolution. Maximum settable value is 3,600 seconds. Can also be disabled to wait indefinitely for a trigger event

External Trigger (EXT) Input

Input impedance	1.01 MΩ ±10% in parallel with 30 pF ±10 pF
Bandwidth (-3 dB)	
DC-coupled	DC - 25 MHz
AC-coupled	10 Hz - 25 MHz
Input range	±5 V or ±1 V, software-selectable
DC accuracy	±10% of full scale input
Absolute maximum input	±28 V (DC + peak AC without external attenuation)
Coupling	AC or DC, software-selectable

Optional Trigger Output

Connector Used	ECLK Customers who want both External Clock and Trigger Output options on their ATS330 digitizers should contact the factory for arriving at an appropriate cabling solution.
Output Signal	5 Volt TTL
Synchronization	Synchronized to rising edge of sampling clock

Materials Supplied

ATS330 PCI Card

ATS330 Installation Disk (on USB Flash Drive)

Certification and Compliances

RoHS 3 (Directive 2015/863/EU) Compliance

REACH Compliance

CE Marking — EC Conformity

FCC Part 15 Class A / ICES-003 Class A Compliance

All specifications are subject to change without notice

ORDERING INFORMATION

ATS330-128K	ATS330-001
ATS330-8M	ATS330-002
ATS330: 128K to 8 Meg Upgrade	ATS330-003
ATS330: External Clock Upgrade	ATS330-004
ATS330: TTL Trigger Output Upgrade	ATS330-005
SyncBoard 330 2x	ATS330-006
SyncBoard 330 4x	ATS330-007
ATS330-128K: One Year Extended Warranty	ATS330-061
ATS330-8M: One Year Extended Warranty	ATS330-062
ATS-SDK purchased with a digitizer board or ATS-GPU: License + 1 Year Subscription (Supports C/C++, Python, MATLAB, and LabVIEW)	ATS-SDK
ATS-SDK purchased separately: License + 1 Year Subscription + 5 hours of technical support (Supports C/C++, Python, MATLAB, and LabVIEW)	ATS-SDK-WOD
5 Hours of technical support	SUPPORT-HR5

Manufactured By:

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DATASHEET REVISION HISTORY

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Changes from version 1.3A (Jan 2018) to version 1.3B

Changes from version 1.3 (Sept 2017) to version 1.3A

Changes from version 1.2F (Nov 2013) to version 1.3